

# Lettuce

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## Introduction

Lettuce belongs to the Compositae (sunflower or daisy family), *Lactuca sativa*. It is an annual plant native to the Mediterranean area. Cultivation may have started as early as 4500 BC, perhaps initially for the edible oil extracted from its seeds. Salad lettuce was popular with the Ancient Greeks and Romans. Cultivated lettuce was probably derived from the so called wild or prickley, lettuce *Lactuca scariola*. The primitive forms of lettuce were loose and leafy. Firm heading forms became well developed in Europe by the 16th Century. Oak leaved and curled-leaf types of various colors were described in the 16th and 17th centuries in Europe. There are 5 types of lettuce

- (1) Crisphead
- (2) Butterhead
- (3) Cos or Romaine
- (4) Loose Leaf or Bunching
- (5) Stem Lettuce (celtuce)

Head lettuce grows best at 15-18°C. Germination takes place at a minimum of 5°C, has an optimum range of 16 to 20°C, and an optimum germination temperature of 20°C (depending on the cultivar and type of lettuce). Hardened seedlings are tolerant (-5°C to -7°C) to frost but mature plants are more sensitive to frost (-1 °C) depending on the cultivar. Warm and dry conditions promote flowering and seed formation (bolting). Bolting occurs where temperatures over 20°C are maintained day and night. Also tip burn problems are serious under this situation as is bitter flavour. Cool nights are essential for quality lettuce. In the Atlantic area it would seem the early soils in the St. John River Valley and the Annapolis Valley are best suited to early lettuce production (June and July marketing) and that coastal areas would be best suited for July, August, September and October production.

Warm sandy soils are preferred for the early harvest, loam to clay loam or peat for late production. Good drainage and high organic matter content are essential. A regular supply of water is essential although high humidity and excess water close to the time of harvest can be destructive to the yield and quality of the crop. Fields low in disease must be selected. Sclerotinia drop has been the most serious production problem in the development of head lettuce.

Leaf lettuce is produced in tunnel houses and in early field stands from the last week of May until late June. This crop can be produced from late May to October but markets are generally early in the season (before head lettuce is available), or for specialty markets in the H.R.I. Trade. Yields depend on the row spacing as well as size of the required product - 2000 dozen to 3000 dozen per hectare (500 g per head). Head lettuce for the early market is usually transplanted in late April or early May for harvest in mid to late June. Head lettuce may be transplanted up to early August depending on the variety and the market. Yields of 2000 dozen per hectare is average and individual fields may yield 3000 dozen per hectare (500 g to 1000 g per head). Romaine lettuce scheduling and yields are similar to head lettuce except that cos lettuce may be grown in tunnel houses for an early crop during the same time period as leaf lettuce (from late May on). Lettuce is currently an important crop which once was grown in larger quantities in the Atlantic Area. The area of Romaine and head lettuce has started to increase but it has a long way to go to replace imports. Lettuce is the vegetable which is imported in the largest volume and has the largest dollar value of any vegetable imported into the Atlantic Area during the time it can be produced here. Currently most

marketing is through roadside markets or deliveries direct to retail stores and small wholesalers. If we can control sclerotinia drop, and get adequate cooling equipment we should be able to grow head lettuce successfully.

*Nutrient Content:* Useful amounts of several nutrients including Vitamins A and C; and minerals calcium and iron. The nutrient content is highest in the darker green, outer leaves. Low in calories. Each head contains 65-70 kilocalories.

## Crop Establishment

**Seed Treatment** – Lettuce germinates best at relatively cool temperatures. This crop should be pre-germinated in cool rooms during the summer (seeded in modules or peat blocks) as conditions are generally too hot for good germination even if greenhouses are well ventilated.

**Seeding/Planting** – Begin field seeding as soon as the land can be worked. A succession of seedlings are necessary for continuous cropping in those coastal areas where lettuce can be grown throughout the summer and early fall. Coated or pelleted seed is available so precision seeders may be used. Seed sparsely to reduce thinning. Thin when two or three leaves have formed. Weed control is usually more of a problem with direct seeded fields.

Approximately 275 g of seed will provide transplants for one hectare. Direct seeding requires 1 to 2 kg per hectare unless precision seeded. Lettuce should be seeded at a depth of 0.6 cm or less.

Space rows 30 cm or more apart as determined by machinery. Plants should be spaced 25 to 36 cm apart for head lettuce, and 20 to 30 cm apart for leaf and bib lettuce. Seed sparsely to reduce thinning. Thin when 2 or 3 true leaves have formed. For transplanting seed is usually sown in the greenhouse in early March, 6 to 8 weeks before field planting. Seedlings are transplanted two weeks later into flats with a 4 to 5 cm spacing, into peat pots, peat blocks or plant bands. Module trays may also be directly seeded or transplanted. Plants should be hardened for a week to 10 days before field setting.

Thoroughly soak the soil in the flats with starter solution before transplanting. Keep as much soil as possible on the roots. When transplanting to the field, do not set the plants too deep in the soil or small pointed heads may result.

## Crop Management

**Beds** – Lettuce should be transplanted or seeded on raised beds if possible.

**Irrigation** – A steady supply of moisture is needed for good quality and yields. Irrigation must be monitored along with the weather especially when the crop is approaching maturity since excessive moisture may ruin the crop.

**Plastic** – Plastic mulches provide a barrier between the soil and the plant foliage. This reduces the potential for plant disease. If black plastic is used, weeds are also controlled. For those growers producing specialty lettuce for the H.R.I. trade plastic mulches should be considered.

Plastic tunnels may be used for early leaf and romaine lettuce production. Transplants would be set into these structures in mid-April. Plans are available from your local vegetable extension specialists.

## Nutrition

ALL ADDITIONS OF LIME AND FERTILIZER OR MANURES SHOULD BE BASED ON RECOMMENDATIONS FROM A SOIL TEST.

Lettuce would seem to require moderate amounts of soil fertility. Little research has been done in the Atlantic Area on lettuce fertility.

**Manure** – Manures are generally not recommended due to its weed seed content and the lack of good selective herbicides registered on this crop.

**Lime** – Should be applied to maintain a soil pH in the range 6.0 to 6.8. On peat soils the pH for optimum crop performance is 5.5 to 6.0.

**Nitrogen** – Half of the nitrogen may be broadcast before planting and worked into the soil. The balance is side dressed 3 weeks after transplanting the crop or after thinning of the seeded crop.

**Phosphorus** – Is usually broadcast before planting and worked into the soil but should be banded if possible.

**Potash** – Should be broadcast and incorporated before planting. Lettuce is quite tolerant of salt damage so small amounts of potash may also be banded.

**Sulfur** – Is suggested on soils low in organic matter which are being intensively cropped. Generally these are sandy soils.

**Micronutrients** – Boron, copper and molybdenum applications are required in organic or peat soils. Boron may be beneficial on some mineral soils (use .2 to .3B in the fertilizer). Minor elements are most conveniently applied in the fertilizer but may be sprayed on the soil and incorporated before planting or applied as a foliar spray to the crop itself.

**Application Method** – Broadcast before planting and work in, or preferably band 5 cm below and 5 cm to one side of the seed row. Lettuce with its limited root system is considered to be a poor feeder.

## Pests and Pest Control

### Weeds

Herbicides recommended for use on lettuce will not provide total, season long weed control. Good weed control requires integration of cultural and chemical methods. Lettuce should be planted to land free of perennial weeds, where the annual weed seed population has been reduced by cultural practices such as crop rotation, fallowing or stale seedbed. Herbicides should be ordered early to avoid problems of short supply at planting. Care must be taken to avoid fields where residual herbicides from previous years persist in the soil as crop injury may occur.

## Diseases

### Gray Mold - (Botrytis) fungus

**Characteristics** – Gray mold can appear on plants at all stages although initial infection is often on seedlings in the greenhouse. Seedlings look like they have damping off; while older plants rot at the stem or on lower leaves in contact with soil. A slimy rot spread upwards into the head. A dense fuzzy gray mold appears on infected areas and dark, hard sclerotia (fruiting bodies) may also develop. Disease spreads mostly under moist conditions.

**Control** – Seed should be dressed with suitable fungicide. Use sterile seedbeds and flats and avoid thick stands of seedlings and transplants. Spray at weekly intervals. Use a 3 or 4 year crop rotation. Plow down crop refuse promptly after harvest.

## Lettuce drop - (Sclerotinia) fungus

**Characteristics** – Symptoms begin on the stem near the soil surface. A severe wet rot develops rapidly and spreads downward to roots and upward through the head. Once the base of the leaf is rotted, the leaf wilts, withers and dies. Symptoms successively develop from outer to inner leaves. The head becomes a wet, slimy mass. During wet conditions, a white colony mold develops on rotted plant parts; hard irregular black sclerotia (pea sized bodies) may occur in the mold.

**Control** – Sclerotia can persist for many years in the soil. Wet conditions favor disease. Avoid, if possible, land where beans, lettuce, peas, tomatoes, carrots, cucurbits or cabbage have been grown recently. Practice a 3-year rotation with non-susceptible crops (grasses, corn, cereals, onions or beets). After harvest, disc the field promptly.

## Downy Mildew – (fungus)

**Characteristics** – Usually only a problem in coastal areas. Downy mildew can affect seedlings or mature plants. Symptoms appear first on oldest leaves. Yellowish or light-green blotchy areas appear on the upper sides of leaves. A white, downy mold then appears on the undersides of the leaf spots; finally, the affected areas die. The fungus overwinters in crop residue. Spores are spread by wind. Spore production is greatest at temperatures below 19°C and at relative humidity approaching 100%.

**Control** – At first sign of disease, spray with a fungicide at 7-10 day intervals, using a spreader-sticker. Carry out a 2 to 3 year rotation. "Calmar" has some resistance.

## Rhizoctonia Bottom Rot (fungus)

**Characteristics** – Infection occurs on lower leaves touching the ground. The disease progresses up into the head causing a dark brown, slimy decay. Later the head may dry out leaving a dry, mummified plant. The pathogen lives indefinitely in the soil.

**Control** – Avoid rotating potatoes and other susceptible crops with lettuce. Grow lettuce on 8-15 cm high ridges. Plow down crop residue immediately after harvest.

## Aster yellows - (mycoplasma)

**Characteristics** – Yellowing and curling occur on the youngest leaves. At heading, head leaves are dwarfed and curled and heads remain soft. The mycoplasma can overwinter in many perennial weeds and is spread to lettuce by leafhoppers during their feeding.

**Control** – Eliminate weed hosts. Do not plant lettuce adjacent to earlier lettuce plantings that contain infected plants. Grain or grass crops should not be planted close to lettuce. Apply controls for the leafhopper vector.

## Slime

**Characteristics** – A physiological disease of hot, humid weather, often aided by bacteria. The greatest single danger to mature lettuce, it produces a wet, slimy decay on lettuce in the field, in transit or in the market. Usually the large, internal leaves are affected first.

**Control** – Aim for a sequence of harvests at optional maturity by successive sowings. Do not overcrowd plants and avoid overwatering. Harvest as soon as mature, pre-cool heads to 1 °C and keep them cool.

## Insects

## Cutworms

**Characteristics** – Cutworms are common pests in the Atlantic Provinces. Most of the damage is to newly set plants in the field. Plants are commonly cut off at ground level but some species can climb and feed on the lower leaves of the plants.

## Aster (six-spotted) leafhopper

**Characteristics** – The leafhoppers can carry aster yellows from plant to plant as they feed. They are small (4 mm long), slender, wedge-shaped insects. They are greenish-yellow in color. Once a leafhopper feeds on an infected plant, it can spread it to all the other plants it feeds on. They feed on many other crops such as potatoes, tomatoes, celery, spinach, lettuce, onion and squash.

**Control** – Planting time treatments include granular or soil-injected insecticides. Alternatively, spraying regularly throughout the season can be done. Spray crop and field boundaries at weekly or twice-weekly intervals from time of transplanting or emergence of seedlings. Twice-weekly applications are only necessary during periods of heavy infestation, usually during late July and early August.

## Aphids

**Characteristics** – Aphids are small, soft-bodied, slow-moving insects. They are often found in large colonies on the undersurface of leaves. A colony consists of winged and wingless adults and various sizes of nymphs. Aphids may be black, yellow or pink, but mostly are various shades of green. Lettuce aphids are small, green or pinkish and feed on the inner leaves and within the heads. Other aphids feed on the under- sides of leaves and curl or stunt them. Some aphids will also feed on the roots thereby stunting the plants. Control: Use granular insecticides and/or foliar insecticides as necessary.

## Slugs

**Characteristics** – Slugs eat the leaves of the crop and cover it with unsightly slime tracks.

**Control** – Baits containing metaldehyde, a specific poison for slugs, can be used but are considered too costly in commercial plantings. Slugs prefer areas which are cool, moist and high in organic matter. Sod crops, weedy fence lines and hedgerows fulfil these conditions. Since slugs can over-winter fairly easily, cultural practices aimed at controlling them should begin at least one year before the susceptible crop is put in.

SPECIFIC CHEMICAL CONTROLS FOR THE VARIOUS CROP PESTS DISCUSSED MAY BE FOUND IN THE APPLICABLE PEST MANAGEMENT GUIDES ON THE PERENNIA WEBSITE

## Harvesting and Handling

Harvest leaf lettuce as soon as the plants are large enough.

Harvest head lettuce as soon as heads become firm. Harvest early in the morning, if possible, and keep cool until marketed.

## Storage and Conditioning

Rapidly cooled lettuce in good condition can be stored for 2 to 3 weeks at a temperature of 0°C, and a relative humidity of 95% or over. Vacuum cooling is the best treatment for quickly removing field heat to temperatures near 0°C, and this is effective in extending the storage life of this vegetable.

## Bibliography

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